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DEPARTMENT FOR ENVIRONMENTAL PROTECTION

DIVISION OF WATER

200 FAIR OAKS LANE, 4TH FLOOR

FRANKFORT KENTUCKY 40601

www.kentucky.gov

January 19, 2012

City of Murray
Attn: L. Peyton Mastera, Projects Administrator
104 N. 5th St, Suite C
Murray, Kentucky 42071

RE: City of Murray
AI # 515
Bee Creek Green Project Reserve

Dear Mr. Mastera:

Thank you for submitting the required documentation to support a "Categorically Green Project" classification for the Bee Creek WWTP Expansion and Collection System Improvements, funded through the CWSRF program. A provision of the 2011 CWSRF capitalization grant requires that to the extent there are eligible project applications; states shall use 20% of its Clean Water State Revolving Fund capitalization grant for green infrastructure projects. These projects are intended to address water and energy efficiency improvements or other environmentally innovative activities. The Kentucky Division of Water (KY DOW) has reviewed the information to support a "categorically green" classification and has found the justification to be acceptable. This project is categorically green, with the exception of the collection system rehabilitation. That construction activity cannot be considered green because it increases structural capacity, results in higher energy consumption and treatment costs. The acceptable categorically green components total \$5,510,000 in construction costs. If the scope of the project is altered in any way to exclude the GPR eligible components, the City of Murray shall submit the changes in writing to the KY DOW and receive prior approval in writing before proceeding with construction.

We look forward to working with you in finalizing your wastewater infrastructure project. If you have any questions regarding this correspondence, please contact me at (502) 564-3410, ext 4832.

Sincerely,

Greg Goode, P.E.
Water Infrastructure Branch
Division of Water

Cc: Todd Solomon, P.E., GRW
CWSRF File



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GRW Engineers, Inc.

January 6, 2012

Ms. Amanda Yeary
Division of Water
Water Infrastructure Branch
SRF Coordinator
200 Fair Oaks Lane
Frankfort, KY 40601

**Re: Bee Creek WWTP Expansion and
Wastewater Collection System Improvements
Business Case for
Green Project Classification
SX21035001
GRW Project No. 3821**

Dear Ms. Yeary:

After review of the Kentucky Infrastructure Authority's *CWSRF Project Descriptions and Examples for Green Project Reserve*, the City of Murray and GRW hereby submit the following components of the referenced project as meeting the requirements of a green project classification:

1. Water Efficiency

Non-Potable Water Pumps to Reuse Treated Effluent (\$15,000)

The new non-potable water pumps will allow the use of treated effluent for irrigation and washdown water throughout the site. This conservation, or recycling, of water helps reduce the overall cost, energy, and chemical usage by providing an alternative to potable water that would otherwise be needed for these tasks.

On average, the non-potable water pump station delivers about 15 gpm for continuous washing of the drum screen, 15 gpm for an average of one and a half hours per day for washing the drum screen compactor, 15 gpm for an average of two hours per day for washdown water for tank cleaning, and an unknown amount of water for irrigation purposes during the summer. The known usage equals approximately 25,000 gallons/day, which means that an annual potable water savings of over 9 million gallons would be realized by installing the non-potable water pump station. On average, the cost of potable water treatment (annual water treatment plant expenses of approximately \$663,541 divided by annual water produced of approximately 1,284,625,000 gallons) is \$0.52 per 1,000 gallons. Based on this cost for potable water production, the annual savings to use non-potable water instead of potable water would be approximately \$4,680 (9 million gallons times \$0.52 per 1,000 gallons). The new non-potable water pumps provide a benefit by reducing the amount of potable water that needs to be produced by the City for consumption, thus reducing the overall cost to the water department.

2. Energy Efficiency

Collection System Rehab to Address Capacity and Inflow/Infiltration Issues – Four Projects (\$5,300,000)

Collection system rehab will replace smaller clay pipes that are susceptible to infiltration with larger PVC pipes. The larger PVC pipes will reduce infiltration and have a higher carrying capacity than the old clay



Ms. Amanda Yeary

Page 2

January 6, 2012

pipes. Even though the new pipes will result in lower infiltration, the new pipes will also be larger and have a higher capacity allowing the sewers to carry more flow, which was previously being lost as overflows during heavy rain events. For this reason, the model predicts that net flows to the pump stations and wastewater treatment plant will increase with installation of the new pipes.

There are four separate collection system gravity sewer projects (Old Bee Creek Interceptor, East Fork Clarks River Interceptor, Gatesborough Gravity Sewer, and Southwest Gravity Sewer), which will increase existing sewer capacity and reduce the amount of rainfall induced infiltration that currently gets into the system through these specific pipes. During current dry weather conditions the target sewers operate at an average of 49% of their capacity. Capacity usage increases to 149% during design storm conditions (2-year, 24-hour storm event), and produce a modeled total overflow volume of 2.5 million gallons over 48-hours. The modeled overflow volume for the design storm in 2030, based on the 20-year planning period from the Wastewater Facilities Plan, is more than 7.2 million gallons over 48-hours. On average, the cost of sewage treatment (annual WWTP expenses of approximately \$1,194,675 divided by annual flow of approximately 56,760,000 gallons) is \$0.69 per 1,000 gallons. Based on this information, the additional annual cost to treat the modeled overflow volumes for the design storm in 2030 is approximately \$4,968 (7.2 million gallons times \$0.69 per 1,000 gallons).

The East Fork Clarks River Pump Station receives flow from the East Fork Clarks River Interceptor. The pump station has three 15 Hp pumps with a total capacity of 2,300 gallons per minute (gpm) with two pumps operating. During the design storm, due to capacity issues with the existing pumps, there is a modeled overflow volume in the year 2030 of 414,826 gallons in the upstream interceptors. This modeled overflow volume would require an additional 3 hours of pumping to relieve the station of the flow above and beyond station design capacity.

The Bee Creek WWTP influent pump station receives flow from the entire collection system. The pump station has three 40 Hp screw pumps with a total capacity of 8,402 gallons per minute (gpm) with two pumps operating. During the design storm, due to capacity issues with the existing pumps, there is a modeled overflow volume in the year 2030 of 4,169,426 gallons in the upstream interceptors. This modeled overflow volume will require an additional 8 hours of pumping to relieve the station of the flow above and beyond station design capacity.

As stated previously, even though the new pipes will result in lower infiltration into those specific pipes, the new pipes will also be larger, have a higher capacity and allow the sewers to carry more flow, which hydraulic modeling indicates was previously being lost as overflows during heavy rain events. For this reason, the model predicts that net flows to the pump stations and wastewater treatment plant will increase with installation of the new pipes. As a result, pumping and treatment costs will increase, while public health and the environment will benefit due to the elimination of modeled overflows.



Ms. Amanda Yeary
Page 3
January 6, 2012

Energy Efficient Blowers for Sludge Holding Tanks and Vertical Loop Reactor (\$150,000)
Energy Efficient Lighting and HVAC in New Headworks Building (\$100,000)
Energy Efficient Influent, RAS, Effluent, and Stormwater Pumps (\$1,000,000)
Variable Frequency Drives on Activated Sludge Aerators (\$250,000)

New energy efficient equipment, such as blowers, lighting, HVAC, pumps, and variable frequency drives (VFDs) will consume less power than existing equipment due to higher efficiency ratings. As a direct result of EPCA 2005, the new lighting will be 25 to 40% more energy efficient than what is currently installed due to lighting power density, occupancy sensors, and controls. Along the same lines, the Energy Independence & Security Act (EISA) of 2007 updated mandated efficiency standards for general purpose motors up to 500 hp. Variable Frequency Drives (VFDs) control the frequency of electrical power supplied to a motor, thus saving energy by matching system demands. The cost savings with variable torque drives can be significant, often paying for the cost of the VFDs in a short period of time. This is due to the fact that the torque varies roughly with the square of the speed, while horsepower required varies roughly with the cube of the speed, resulting in a large horsepower reduction for even a small reduction in speed. Combined with supervisory control and data acquisition (SCADA) systems, this can result in cost savings of thousands of dollars per year.

3. Green Infrastructure

Permeable Pavers (\$10,000)

Permeable pavers mimic natural landscapes to capture, cleanse, and ultimately reduce the amount of stormwater entering sewers, creeks, and waterways. They help improve water quality and create a more environmentally friendly system by allowing stormwater to soak through the pavement and into the soil. The permeable pavers that are presently available can be placed most anywhere traffic is expected due to their ability to handle H-20 loadings. It is expected that these pavers will be used on any newly paved areas on the Bee Creek WWTP site.

4. Environmentally Innovative Activities

Biological Nutrient Removal for Phosphorus and Nitrogen (\$3,050,000)

The Vertical Loop Reactor (VLR) qualifies as an environmentally innovative activity through CWSRF Technical Guidance 4.4-1b "Technology or approach that is not widely used in the State, but does perform as well or better than conventional technology/approaches at lower cost". There is currently only one VLR in operation in Kentucky – at the City of Maysville (designed by GRW) – out of approximately 260 (0.38%) publicly owned treatment works (POTWs) in the state. This meets the first portion of the aforementioned Technical Guidance requirement.



Ms. Amanda Yeary

Page 4

January 6, 2012

The preliminary design for Murray's VLR is capable of meeting a 1 mg/L Phosphorus limit and an assumed future 5 mg/L Nitrogen limit at the projected 20 year flows and loadings. These effluent treatment limits meet the "...as well or better..." performance requirement stated above when compared to the construction of a new oxidation ditch with anaerobic and anoxic reactors. Lastly, per the Facilities Plan, the VLR option has both lower estimated construction and total project costs than any of the other three options considered (two oxidation ditch options, as well as a sequencing batch reactor option). This meets the "...at lower cost" portion of the CWSRF Technical Guidance 4.4-1b requirement.

Ultraviolet (UV) Light Disinfection to Reduce Chlorine Exposure Hazard (\$935,000)

The replacement of chlorine disinfection with ultraviolet (UV) light disinfection qualifies as an environmentally innovative activity through CWSRF Technical Guidance 4.5-5a "Projects that significantly reduce or eliminate the use of chemicals in wastewater treatment". It is significant in the fact that it eliminates the need to have a hazardous chemical on-site. Chlorine exposure in humans produces acids in the body that can cause severe damage to cells and even death. The replacement of chlorine disinfection with UV light disinfection eliminates the chance of a chlorine leak that can spread quickly and cause harm to those who come in contact with the chemical.

If you have any questions, or if you need additional information, please contact me at 502-489-8484, or tsolomon@grwinc.com.

Regards,

Todd Solomon, P.E.

Project Manager

cc: J.L. Barnett, City of Murray
Peyton Mastera, City of Murray
Jasper Wyatt, PADD